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A SYSTEMATIC REVIEW OF EFFICIENT DATA DISSEMINATION IN WIRELESS SENSOR NETWORK BASED ON MOBILE SINK

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ABSTRACT

A wireless sensor network is a huge collection of sensor nodes with insufficient power supply & self-conscious computational capability. Due to the restricted communication range & high density of sensor nodes, packet forwarding in sensor networks is frequently achieved through multi-hop data communication. Wireless Sensor Network with mobile sink has freshly received a slice of consideration from the research community. Its tempting characteristics of providing lengthier network lifetimes, delay optimizations and the flexibility to adapt dissemination strategies conferring to applications necessities have proved to be more effectual. Abundant mobile sink based data dissemination stratagems have been anticipated. Subsequently, the leading purpose of this review is to show the beginning of the numerous approaches and its fundamental experiments using mobile sink, as well as the basic inspirations for using these methods in wireless sensor networks. In this paper, a review of routing protocols & algorithms used in Mobile sink based WSNs is presented with energy Efficient Data Dissemination as the main goalmouth**.**

KEYWORDS: Wireless Sensor Networks, Mobile Sink, Mobile Base Station, Routing Protocols, Energy Efficiency, WSN Routing Protocol, Location Aware, Scalability, Hierarchical, Clustering, Review

1. INTRODUCTION

Wireless sensor networks have critical applications in the scientific, medical, commercial, and military domains. Examples of these applications include environmental monitoring, smart homes and offices, surveillance, and intelligent transportation systems. It also has significant usages in biomedical arena. As common dependence on wireless sensor network skill rises, we can suppose the extent & difficulty of separate networks as well as the number of networks to increase dramatically [1].

Wireless sensor networks are classically used in extremely dynamic, & hostile surroundings with no human presence (unlike conservative data networks), & therefore, they must be accepting to the disappointment & loss of connectivity of separate nodes. The sensor nodes should be intellectual to improve from failures with minimum human participation. Networks should support process of autonomous formation of connectivity, addressing, and routing structures [2]. Current improvements in wireless communication skills & the production of reasonable wireless strategies have controlled to the overview of low-power wireless sensor networks [3].

Temporarily, designing appropriate routing protocols to achieve different enactment stresses of numerous applications is considered as a significant issue in wireless sensor networking. In this situation, researchers have projected

several routing protocols to increase performance demands of dissimilar applications through the network layer of wireless sensor networks protocol heap [4, 5]. It was only later that mobile sink data dissemination approach got real attention. Its multi-fold advantages like hot spot problem removal, longer network lifetimes, energy optimizations were realized and studied. This lead to the proposal of numerous mobile sink data dissemination strategies. Sink mobility introduced new issues that did not exist in data disseminations techniques with the static sink. This encouraged us to write an up-to-date state of the art assessment on Mobile sink based WSN data dissemination techniques, the available opportunities and its related concerns.

1.1 Wireless Sensor Network Characteristics

A wireless sensor network (WSN) is a network that is complete of hundreds or thousands of sensor nodes which are tightly organized in an unattended situation with the abilities of sensing, wireless communications & calculations (i.e. gathering & disseminating conservational data). These spatially disseminated independent devices supportively monitor physical & conservational situations, such as temperature, sound, vibration, pressure, motion or pollutants, at dissimilar places [6]. The basic architecture of Wireless sensor Network is shown in Figure 1.

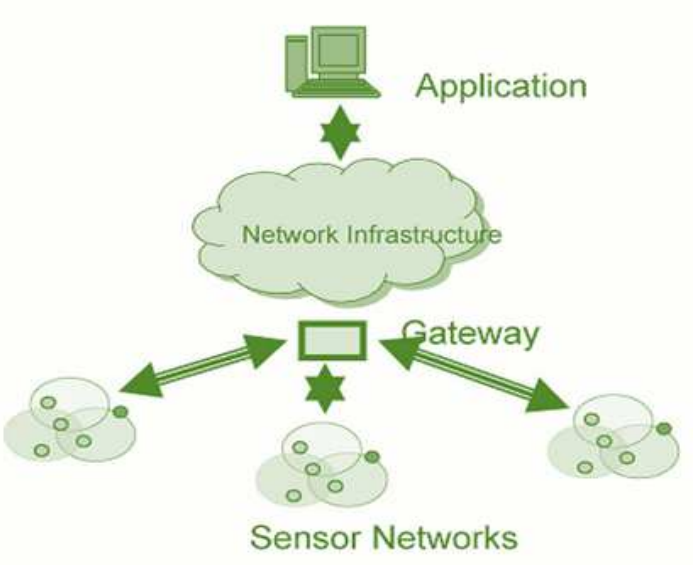

Figure 1: Basic Architecture of Wireless Sensor Network [6]

1.2 Classification of Sensor Network

The sensor networks are divided into three classifications: micro-sensor networks, interior sensor networks and outside sensor networks. The micro-sensor networks can be used in monitor temperature of the human body. The interior sensor networks may be application, such as sensing bridges or building to understand status. The outside sensor networks can be application on wilderness or forest and dangerous region. Depending on situation, the design fit of the sensor networks.

Sensor Networks can be categorised on the basis of their approach of working & the sort of target application into two main kinds. They are

a) Proactive Networks

The nodes in this system change on their sensors & spreaders occasionally, sense the data & communicate the sensed data. They deliver a snapshot of the situation & its detected data at regular intermissions. They are appropriate for applications that need interrupted data observing like humidity gratified of a land in farming.

b) Reactive Networks

The nodes in this system respond directly to abrupt & extreme variations in the value of the sensed feature. They are therefore suitable for time serious applications like armed investigation or temperature sensing.

Requirements and Design Factors in Wireless Sensor Network

Subsequent are certain of the basic necessities & design factors of wireless sensor network which serve as strategies for growth of protocols & algorithms for WSN communication design [6-7].

- Fault Tolerance, Adaptability and Reliability
- Power Consumption and Power management
- Network Efficiency and Data Aggregation
- Intelligent Routing
- Management challenge

Structure of this Assessment

The edifice steps of this paper is as follows. The Introductory Section ends with a brief introduction of wireless sensor network and basic principles. In Section II, we address the characteristics and design goals for wireless sensor network. It also consist of classification of WSN, requirements and design factors within WSN

Section III gives a detailed analysis of mobility patterns within different mobile sink based WSN data dissemination strategies. Sinks can adopt mobility schemes according to the nature of WSN application and its requirements. It may be random, predictable, or controlled.

In Section IV, we analyse the mobile sink based WSN data dissemination strategies. Several simulated structure based data dissemination procedures have been analysed in this section of work.

Section V discuss data dissemination for caching in wireless sensor network. Section VI to Section XI show the review of grid-based approaches, cluster-based approaches, tree-based approaches, agent-based approaches, area-based approaches and non-hierarchical approaches for mobile sink based WSN and a general conclusion of the paper is in Section XII before references.

2. MOBILITY PATTERNS IN MOBILE SINK BASED WSN

Sinks can adopt mobility schemes according to the nature of WSN application and its requirements. Sink may be in continuous motion updating the paths as it moves. Some mechanisms propose anchor position based solutions. Sink sojourns at some position for certain duration, paths are configured, queries sent and data forwarding takes place. After

sometime sink moves to a new position and restarts Mobility schemes of the sinks can be classified into the following categories [9]

1) Random Mobility

This is the most widely adopted scheme for Mobile Sink based WSN [8-15]. No network information is required as sink's decision of deciding next sojourn position is random. This is easily applicable solution as sink's movement pattern does not depend upon network conditions. This may not give optimal network lifetimes. It might be possible for source nodes to route data towards various places of the network. Random mobility needs constant sink location apprises & route renovation.

2) Predictable Mobility

In certain applications user (sink) moves according to a certain strategic plan. Sink could inject its trajectory information into sensor network. Sources then use this information to determine sink's future location. Some author propose predictable mobility patterns based solution (PMDD). Authors are of the view that movement pattern of battlefield soldiers and firefighters are determinable in advance as they follow a planned strategy. In PMDD sink sends a data query which contains its direction and speed. This enables the source node to predict sink's position after time *t*. Source node then accordingly directs data towards sink's current location. Predictable sink location technique does not require frequent sink location updates. This is much efficient than non-predictable mobile sink routing strategies that require global [15] or in some protocols local updates [16] [17] [18] of the routing paths. Another category includes periodic movement over fixed paths like a straight line or in a circle. This enables the source nodes to estimate sink arrival time. Sources can optimize their sensing tasks and transceiver energy consumption in WSN.

3) Controlled Mobility

Sink mobility is not predictable but could be controlled by certain network parameters such residual energy, event location etc. Sink takes mobility decisions to increase the network's lifetime. This kind of work proposes a sink mobility strategy for continuous data-gathering applications. Every propagated data packet contains the position and Id of maximum and minimum residual energy nodes encountered on the path. Once sink has this information it moves towards the node with maximum residual energy by avoiding the minimum residual energy containing paths.

Some authors propose a similar but heuristic approach for controlled sink mobility called Greedy Maximum Residual Energy (GMRE) mechanism. Sink collects residual energy information from surrounding areas. An area with better residual energy than sink's current position greedily directs the sink towards it. Unlike previous one, sink also takes into account current data routes release cost, new route establishment cost, sink mobility rates and constraints on sink mobility to increase global energy efficiency.

3. MOBILE SINK BASED WSN DATA DISSEMINATION STRATEGIES BASED ON INFRASTRUCTURE

Several effective set-up based data dissemination protocols have been projected for the mobile sink based WSN in a last period. Based on the mobility pattern displayed by the sink in the sensor arena, the data gathering or dissemination arrangements can be categorized into controlled & uncontrolled sink mobility arrangements. In controlled sink mobility

arrangements [8]-[11], the mobility (quickness and/or path) of the sink is operated & organized either by an external spectator / in the accordance with network dynamics. Unrestrained the sink mobility based arrangements are considered by the information that the sink types its following change separately in relations of speed & direction.

Directed diffusion, TTDD, ADMR algorithms with static sink are presented in [19–21] respectively. Scalable Energy-Efficient Asynchronous Dissemination (SEAD) where a tree-like communication structure is built and maintained is presented. The sink moves randomly to sensor nodes in the tree. Communication between sink and the access points can be multi-hop. The trade-offs are that the data latency and energy needed for tree reconfiguration. Tong et al. [22] states that this algorithm is best for data dissemination with mobile sink. The main contribution is towards energy efficient transmission to the passing sink [23–26]. Sinks move along the same route repeatedly.

Hwang et al. [26] determines the transmission range needed to collect data from a predefined percentage of the sensor nodes, given the observer speed, the time required to transmit a packet, and different traffic patterns. Various methods for building and maintaining routes to a mobile sink are presented [27–29]. Hu et al. [27] presents local update techniques for detecting disconnections and performs route repair in “sink-oriented trees”. Akkaya et al. [28] proposed ERUP protocol for conducting route rediscovery only in the vicinity of the damaged route. Xuan et al. [29] presents initial route building. Sink moves, if route is invalid, forwarded nodes are designated to extend the current. Sink moves according to the random waypoint model [22, 24, and 30]. Sink (airplanes) are introduced where movement of sink is fully controlled.

Depending on the structure of the wireless sensor networks, there are three main categories of the data collecting protocols in WSNs. Flat-based routing, hierarchical routing and location based routing [31]-[32]. A mobile sink routing algorithm mitigates the hotspot problem and improves the lifetime of the sensor network. There are various hierarchical routing protocols approaches with mobile sink in many contexts have been existed.

3.1 Self-Deployed Virtual Architectures of Mobile Sink in Wireless sensor network

Chen et al. [12] obtainable the converge-cast tree algorithm named as the Virtual Circle Combined Straight Routing (VCCSR) that obtains a virtual structure involved of virtual rounds & straight outlines. An establishment of nodes are selected as cluster heads along these virtual rounds & straight summaries. Composed a set of cluster-heads form the virtual network of backbone. The sink mixes sensor field & preserves communication with the boundary cluster-heads for data gathering. The cluster heads in VCCSR monitor a group of communication procedures to diminish the routes re-adjustment cost in spreading the sink’s latest position information.

Hexagonal cell-based Data Dissemination (HexDD) projected in [13] builds a hexagonal grid construction to discourse real-time data delivery while compelling into deliberation the dynamic situations of numerous mobile sinks & occasion the sources. Based on 6 directions of the hexagon, HexDD explains query & data meeting lines to evade terminated broadcast of sink’s data requests. Nodes send their information to adjacent boundary line which is then spread towards the middle cell. Nodes along the edge route collect & reproduce the data

Oh et al. suggested a scheme of data dissemination named as the Backbone-based Virtual Infrastructure (BVI) in [14] that generates a use of the single-level multi-hop clustering. It aims to reduce the entire amount of clusters & thus the scale of network overhead related with updating all the CH nodes about the sink’s position data. For clustering it works HEED [15] where significance is specified to remaining energy level of nodes in selecting the CH nodes. To preserve the

path of sink position data, it accepts that the network worker employs a definite CH node as source of the tree. Whenever, the mobile sink links the sensor arena, it records itself with the neighboring CH via a node of agent. The host CH node accordingly informs other CH nodes along the direction to the root CH about the sink's position information. Additionally, when a mobile sink transfers within a cluster, the particular CH node only proceeds maintenance of linking with the sink within the cluster & evades circulation of sink position bring up-to-date to root.

The Multiple Enhanced Specified-deployed Sub-sinks (MESS) in [16], produces a simulated band in the center of sensor arena thereby engaging improved wireless nodes (sub-sinks) having extra storing capability at identical distances. The set of the sub-sink nodes along the obtainable track serve as meeting points for the mobile sink & gather & stock data from sensor nodes. In data distribution phase, mobile sink overflows the request along the virtual band till it influences to node of sub-sink keeping the data. Upon getting the query from the mobile descend, the sub-sinks route their placed data to the mobile sink using environmental forwarding method. A comparable method has also been projected in Line-Based Data Dissemination (LBDD) [17] which builds a vertical line by separating the sensor arena into two equivalent sized blocks. Yet additional comparable method can be found in [18], which residences a virtual rail (called Railroad) in the center of the sensor arena where nodes privileged the virtual rail's locations serve as meeting points.

3.2 Geographical Architecture for Data Dissemination using Mobile Sinks

The focal control of MESS, LBDD, & Railroad is the primary energy reduction of nodes near to the virtual building as the similar nodes are frequently selected as transmits for the beyond nodes. Additionally, MESS also executes location of improved nodes along the virtual band which bounds its applicability.

In Quad tree-based Data Dissemination (QDD) projected by Mir & KO [33], a node upon identifying an occurrence computes a set of rendezvous points (RPs) by continuously unravelling physical network space into 4 quadrants of constant sizes. After separating the network, QDD routes the experimental data to those nodes which are near to the centroid of each divider. The mobile sink distributes query packet using the similar method by querying the node at neighboring RP first, tracked by the following RP nodes till it spreads the compulsory data report. In static nodes placements, the similar set of nodes developed RPs constantly which consequences in early energy reduction of those nodes & thus reduces the total network generation.

The Virtual grid based Two-Tier Data Dissemination in [34] proactively builds a constant per source node virtual grid structure covering the whole sensor field. For data gathering, the mobile sink overflows its local grid cell anywhere the query packet makes use of wholly the distributing points along virtual grid till it becomes to the source node. Throughout query dissemination procedure, an opposite path is also recognized for data commentary to the mobile sink. TTDD although evades the overflowing of the sink's topological apprises, nevertheless, the source virtual grid building challenges the network generation.

Geographical Cellular-like Architecture (GCA) in [35] proactively builds a cellular-like classified hexagonal virtual building for supervision sink mobility. The GCA such as the home-agent in cellular networks services the node near to the middle of the cell as the header node & comment the repose of the nodes as associate nodes. For data gathering, the mobile sink conducts its request to nearest header which then spreads the query to entirely the headers. To handle the sink mobility, when sink links another cell, it notifies the old cell's header around the novel header which re-route the packets

consequently.

The Hierarchical Cluster-based Data Dissemination in [36] suggests a hierarchical cluster architecture where additional level cluster-heads of mobile sink are designated as routing agents. The routing agents are accountable to keep track of sink's latest position information & all the cluster heads route their composed figures to the close routing agents. When sink transfers from one point to another, it notifies the adjacent routing agent via the neighboring cluster-head. The routing agent upon sink detection transmissions the sink's latest position information to all other routing agents. In the high sink mobility, nodes using the HCDD suffer from the high energy consumption.

The location awareness requires whether the careful arrangement needs the nodes to be conscious of their physical/relative directs. This characteristics is fairly helpful in creating the virtual organization in addition to the routing of query & answer packets [36], [37]; nevertheless it suffers certain extra energy cost. The second factor delivers an approximation of the overhead cost complicated in creating & preserving the delivery of data routes to the newest location of mobile sink. For rapid delivery of the data packets to mobile sink, nodes necessary to be educated of the latest position of the mobile sink.

4. DATA DISSEMINATION IN CACHING FOR WIRELESS SENSOR NETWORK

In Wireless Sensor Network sink inserts the query into the Network & sensor nodes replies to the query & the traffic rest on number of queries produced / mean time [38]. If the sensor node having info about the query then it responses to sink otherwise it overflows the query to the other nodes.

The sensor node will answer to the sink node complete certain routing protocol. A sensor node also associates sum of responses to a particular reply which keeps the number of packets to refer back to sink node. If Wireless Sensor Network (WSN) contains multiple sinks & two dissimilar users makes alike query in network for such the scene each sink will choice its personal path to the source node which rise the traffic into the network & utilize more power.

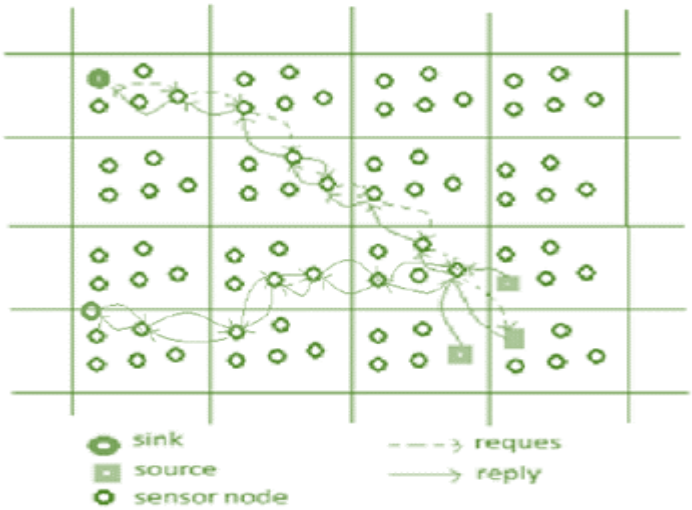

Figure 2: Sink Request and Source Reply Process

But sensor network has incomplete battery power. So for management such matters we use caching. Caching is a method use to passing stock the data. In WSN it's used to supply event information into sensor node. Cache can be refining the energy effectiveness in Wireless Sensor Networks. Recovering data straight from source node utilize large quantity of

power & it can be condensed by using caching [39]. It also decreases needless load from the network. Sensor nodes have partial storing capability so it use cooperative caching plan to stock the data. In cooperative caching a node be able to practice its close node's memory to stock information which is called cumulative caching. In caching author choose any node which is close to sink & use it to stock information.

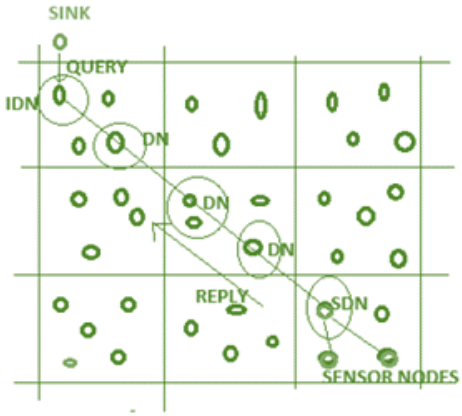

Figure 3: Path Setup in Sensor Field

This node is identified as Immediate Dissemination Node & the node who intelligence the data is called source Dissemination Node and all the other nodes in path among IDN & SDN are called Dissemination Nodes. And the movement of data from one node to one more node is called data dissemination. Cooperative caching decreases inter-node transmission & delay in becoming the data things. Sink caches the facts things in its local cache until its memory developed full.

After that it permits data to its Immediate Dissemination Node & When IDNs local cache is full it exploits one of its neighbor nodes retentions & when it full it transmit to next node from the cache region of IDN. There is a related TTL (Time to Live) value with all data thing which rejects the dishonored data packets. So by using cooperative caching data is kept close to the sink which reduces needless traffic from the sensor network & increase its battery lifetime.

5. DATA DISSEMINATION IN MOBILE SINK WIRELESS SENSOR NETWORK USING GRID-BASED APPROACHES

Protocols of this session service a grid structure as the advanced level of the virtual hierarchy. Nominated high-tier nodes establish the crossing-points of the grid. Numerous shapes could be used to create up the grid: hexagons, rectangles, triangles etc. Later the network is typically an ordered structure, geographic coordinates of the sensors are mandatory, hence position-aware sensors are favored.

5.1 Two-Tier Data Dissemination Protocol

It is a Two-Tier Data Dissemination protocol used in in large scale wireless sensor networks. The TTDD protocol suggested in [40], constructed a two-tier data dissemination structure to enable fast data forwarding. This protocol solves the hierarchical routing problems in a sensor network with mobile sinks. It allowed nodes that are data sources proactively report data to the mobile sink. Source node uses an algorithm to construct a grid structure in the network for itself as a crossing node. The crossing node maintains events and source node information. The cluster node sends flooding request message to neighbour nodes for searching the data. The data would be sent in reverse direction [41].

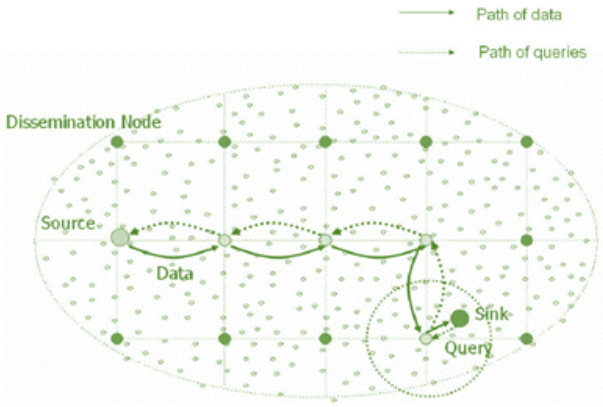

Figure 4: A Skeleton of Two-Tier Routing in TTDD

Pros & Cons: Grid-based protocols are beneficial for the easy-accessibility of the grid construction. Together the source nodes & the sinks can spread the grid with negligible quantity of hops. However, creation of the network is nontrivial. TTDD grieves from the high overhead of building a distinct grid for all source node particularly in requests where many sensor nodes produce facts.

5.2 Grid Based Energy Efficient Routing

Kisuk kweon et al have proposed [42] for communication from multiple sources to multiple mobile sinks in wireless sensor network. It is a Grid-Based Energy-Efficient Routing, it creates a single mutual grid structure for all probable sources. Location-awareness of sensor nodes is essential to build the grid structure, data needs created from the sink & data statements created from the source are spread through the grid construction. While data requests are propagated vertically data statements are spread parallel along the grid to confirm that these packets meet at an intersection point. The location of the sink is refer to the basis node, and data is transported directly to the sink [42].

Pros & Cons*:* GBEER aims to remove the high overhead of constructing distinct grids for all source (as in TTDD) by creating & preserving a mutual grid structure, but the nodes create up the grid are probable to be hotspots & decease earlier than other nodes. To overwhelm this difficulty the grid have to be altered from time to time which is awkward. Uniform varying a single intersection point needs notifying the four adjacent intersection points which will present additional circulation on several nodes exist in among the intersection points.

5.3 Coordinate Magnetic Routing

Coordinate Magnetic Routing (CMR) [43] constructs a virtual rectangular grid similar to GBEER It constructs a virtual rectangular grid in the network. Magnetic diffusion approach is used to generate a MF over the nodes where the nodes significant about the source nodes have positive polarization & nodes knowing the sink's position have negative polarity. The sensor data are referred in the perpendicular direction & the sink location announcements are referred in the horizontal direction along the grid. When a data packet is established by a node with negative polarity it is the awareness of the sink's position in the network [43].

Pros & Cons: CMR grieves from the similar disadvantages of GBEER. A benefit of CMR is the doubling of packets drifting on the grid to surge reliability; nevertheless, the idleness of packets strength additionally rise of the energy utilization of the nodes on the grid intersection points & increase the strictness of the hotspot difficulty.

5.4 Hexagonal Path Data Dissemination

Instead of a rectangular grid, the work proposed in [44] employs a mutual grid structure collected of hexagons which is exposed to outperform rectangular grid based methods. The residual belongings of the protocol like GBEER.

Pros & Cons: HPDD grieves from the similar hotspot difficulty on the second-tier structure as GBEER, uniformly a hexagonal grid arrangement is better than a quadrilateral grid in given that small data & sink announcement routes.

6 DATA DISSEMINATION IN MOBILE SINK WIRELESS SENSOR NETWORK USING CLUSTER BASED METHODS

Protocols have its place to this discussion that work on clustering procedure to divide the network & service the CH nodes as the high-tier nodes. Creation of clusters is more complex than the manufacture of a grid; nevertheless, since clustering is a topology-aware instrument which deliberates the circulation of nodes in the field, a more effectual virtual hierarchy is accomplished.

6.1 Hierarchical Cluster-based method for Data Dissemination

This [45] is a hierarchical method which uses clustering to regulate second-tier nodes. A mutual hierarchical construction for all information sources is created. The cluster heads are responsible for propagation of data requests called Routing Agents. The advantage of this routing algorithm is its ability to operate without location information of sensor nodes [45].

Pros & Cons: HCDD's benefit is that it works on a spread clustering algorithm which can work without location alertness of the sensor nodes. Clustering permits an improved option of second-tier nodes; however, the distributed algorithm's overhead is great & successively it again in condition the sequences of the CH nodes are near to reduce is very incompetent.

6.2 Energy-Efficient Mobile Sink Routing Algorithm

Xun-Xin, Yuan, and Zhang Rui-Hua in [46] proposes a new energy efficient routing using the sink mobility where the sink moves based on the average energy of the cluster. Here only one sink is mobile. They propose a future enhancement with more mobile sinks along with other normal nodes also given the mobility. For detecting a mobile target a new protocol is proposed by Yu-Chen et al in [47]. In mobile target of course chances of path loss or connectivity is possible. According to the proposed protocol the nodes themselves can effectively recover the path and perform energy efficient tracking. The issues in inter cluster communication in large scale networks is addressed in [48].

In [49] the number of hops, amount of data in the transmission, the lifetime of sensor nodes can be prolonged and the communication is guaranteed. This algorithm uses cluster-based network structure to implement the mobile sink routing protocol, and the sink movement depends on the average energy in each cluster of the network. The mobile sink compares the average energy of the present cluster with the other clusters received from other cluster-heads, if the average energy is more than any of the received average energy from other cluster-heads, the mobile sink will not move from its present position. Otherwise the mobile sink will move to the cluster which has the maximum average energy in the network.

Pros & Cons: EEMSRA produce clusters with compulsory TDMA agendas to improve energy-efficiency. This technique has MAC layer supplies, so it might not be appropriate to an extensive variety of devices. Another restriction of

EEMSRA is essential for controlled sink mobility. Other than these disadvantages, EEMSRA is a helpful protocol in relations of energy competence. The authors projected a machine to modify the cluster heads in order to moderate the hotspot difficulty.

6.3 Mobile Sink-based Routing Protocol

This protocol [50] employs CH as data aggregation centers where the sensor information of the equivalent clusters are collected. It is a Mobile Sink based Routing Protocol for prolonging the network lifetime in clustered wireless sensor networks. In this protocol mobile sink moves in the clustered network to collect the sensed data from the cluster heads (CHs) within its vicinity. At a particular instant of time CHs in the neighborhood of the mobile sink forward their data to the sink. The rest of the nodes in the network wait for their turn to become mobile sink neighborhood. In this way, during sink movement all the nodes in the network forward their data to the mobile sink, when mobile sink comes in their neighborhood during data gathering mobile sink [50].

Pros & Cons: Mobile Sink-based Routing Protocol is very similar to EEMSRA with one important modification: The sensor data aggregated in the CHs may be acquired only when the sink originates faster than a quantified distance threshold; therefore, MSRP is only appropriate for delay-tolerant applications. Moreover, the procedure does not assurance that the sink will stay all the CHs within a restricted period, hence it is imaginable that certain percentages of the network may not be well attended. However, the projected controlled sink mobility arrangement is well-defined & effectual in spreading the network generation, thus translation this protocol appropriate for requests choosing energy-efficiency rather than fast data distribution.

7 DATA DISSEMINATION IN MOBILE SINK WIRELESS SENSOR NETWORK USING TREE-BASED APPROACHES

This class of protocols build a covering virtual tree construction. The sink announcement is frequently degenerate from the root towards the leaves.

7.1 Asynchronous Dissemination to Mobile Sinks in WSNs

This exploits minimum-cost weighted Steiner trees as the great-tier meeting which chooses duplications at middle points. In this protocol Steiner trees are used as the high-tier structure with minimum cost. To create the sink mobility clear to the overlaying construction, this protocol uses progressive chaining. For creation of the Steiner tree & data dissemination the location-awareness of the sensor nodes is required .This protocol establishes a more intelligent second-tier structure i.e. Steiner tree for efficient data delivery in the network [51].

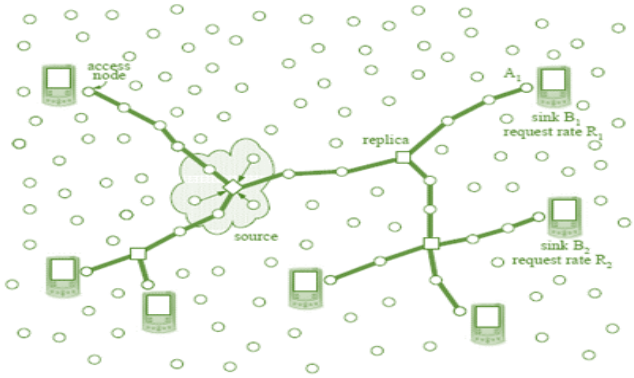

Figure 5: An Example of the SEAD Tree Model in the Sensor Network

Pros & Cons: SEAD expresses & creates a more intellectual second-tier construction which is a Steiner tree. Uniformly the convenience of this assembly is better, the overhead of creating distinct trees rooted on sources is very high.

7.2 Quad-tree Based Data Dissemination Protocol

This [52] divides the system into succeeding quadrants. The middle point of all quadrant develops a second-tier node. The quadrants are divided into lesser quadrants till the purpose of the second-tier nodes are enough for rapid admittance to the simulated structure. Data declarations & queries are referred to the middle points of quadrants in a recursive way until they rendezvous.

Pros & Cons: The overhead of making the quad-tree structure in QDD is negligible as related to greatest of the other hierarchical methods; though, no countermeasure in contradiction of the hotspot difficulty is projected.

8 DATA DISSEMINATION IN MOBILE SINK WIRELESS SENSOR NETWORK USING AGENT-BASED APPROACHES

This class of protocols chooses one or more managers to transmit the traffic among sources & the sink. Managers take on the part of representatives for the sources or the sink. Contrary to the other hierarchical approaches, the agents do not form an infrastructure. With these properties, agent-based approaches can be considered as primitive versions of other complicated hierarchical protocols, employing few disorganized agents as high-tier nodes. These protocols frequently consume uncommon overflowing to promote the position of the managers. An agent based scheme with a single agent is represented in Figure 6.

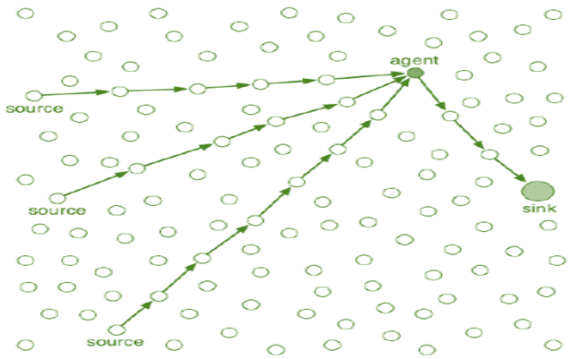

Figure 6: Agent-Based Data Dissemination

8.1 Data Dissemination Protocol (DHA)

Data Dissemination Etiquette Based on Home Agent and Access Node [53] spreads & simplifies the advanced footmark attaching apparatus to handle both sink location announcement & data dissemination. It is an advanced footprint binding device to grip together sink position advertisement & data dissemination. DHA chooses home agents a data aggregation. The load on the home agent is extra & varying the home agent needs universal flooding in the system. The entrance node characterizes the mobile sink to the home agent & home agent denotes the mobile sink to the sensor nodes, measure of the sink is clear to the sensor network [53].

Pros & Cons: DHA chooses a home agent as a data aggregation & dissemination fact. The capacity on the home agent is huge, & altering the home agent needs global flooding. Even though such disadvantages render DHA very energy incompetent, the easiness of the protocol is an important benefit.

8.2 Optimized Agent-based Routing Protocol

This type [54] of agent based works as a single agent which is continually replaced to be in the adjacent of the mobile sink. It provides efficient data delivery to the mobile sink and reduces the delay in data transmission. This algorithm minimizes signaling overhead & advance corrupted route called triangular routing difficulty. All sensor nodes can communicate information to the sinks without delay or extra overhead, by preserving paths among all source nodes & sink pairs. This feature enables OAR to cover a wide range of applications [54].

Pros & Cons: Like DHA, OAR is a modest to run a protocol; nevertheless, it grieves from the similar disadvantages. The relay path among the formerly promoted agent & the present agent is likely to transmit large quantities of traffic which would lead to hotspots & disorganizations in data programme. Since the protocol depend on notifying only the current sources about the agent alteration, the sources which have developed energetic after a long period of idleness would have trouble transporting information to the sink

9 DATA DISSEMINATION IN MOBILE SINK WIRELESS SENSOR NETWORK USING AREA-BASED APPROACHES

These methods elect the nodes in an extent of definite limitations as the high-tier nodes rather than creating complex erections. The hierarchy structure cost of these protocols is negligible. To alleviate the hotspot difficulty, rather than altering the construction, the size of the zone is quantified more sufficient to spread & diminish the additional load on the high-tier nodes.

9.1 Line-based Data Dissemination

Line-based Data Dissemination (LBDD) [55] describes a perpendicular strip of nodes which distribute the field of placement into two equal percentages. The nodes on this strip are mentioned to as in-line nodes. Sensor info are focused to the line & the first in-line node encountered supplies the data. The sink refers a data query to the stripe & the query is spread through the line till the in-line node care the data is extended.

Pros & Cons: LBDD suggests an area-based line construction which is very modest to regulate & establish. The line construction is effortlessly reachable by the source nodes & the sink, thus the overhead of these processes are low. Even with of these compensations, LBDD still depend on transmissions for spreading information requests along the track.

The line has to be more sufficient to alleviate hotspots; therefore, exclusively for large systems, the flooding on the line will cause an important rise in the total energy utilization.

9.2 Railroad Based Virtual Infrastructure

Railroad [56] builds a virtual infrastructure called the rail. The rail is a sealed ring of a band of nodes which has the figure clear by the sketch of the network. The nodes present on rail are known as rail nodes. When that particular node has sensor information, it directs facts around this data to the neighboring rail node. The rail node getting the meta-data builds a station which is a percentage of the rail cantered on the rail node with least thickness of communication variety. The meta-data is shared between the nodes exist in on the position. The sink requests the rail for meta-data & after a position node is extended it notifies the source of the sink's location & then the source node can refer the equivalent data directly to the sink

Pros & Cons: Railroad improves the basic for widespread transmissions on the rail structure by the building of stations, which provides a benefit against LBDD & contributes towards the procedure's scalability. Nevertheless, the predictable data delivery suspensions of Railroad are complex than Line-based Data Dissemination since the sink's queries have to transportable over a considerable extended building.

9.3 Ring Routing Based Local Structure Change Mechanism

Ring Routing [57] offers a ring construction which is a closed ring of single-node width. Ring routing is deliberated to be an area-based method. In this approach the sink promotes its location to the ring by forwarding packets in the direction of the system middle via geographic routing. Hence the ring nodes maintain the new location of the sink at all the periods. In this routing to mitigate the hotspots on the ring a local structure change mechanism is used. Ring Routing is an efficient routing to mitigate the hotspot problem [57].

Pros & Cons: The ring structure is simply reachable & the projected hotspot qualification apparatus has low overhead, which creates RR an effectual protocol. The rapid & direct obtain of new sink location information from the ring permits fast data distribution. The disadvantage of Ring Routing is its uncertain scalability. For big or sparse networks, the overhead of the original ring building is predictable to be high.

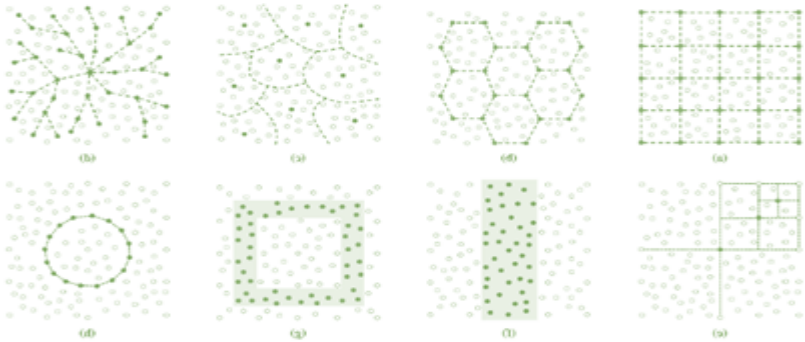

Figure 7: Numerous Hierarchical Structures: (a)Two-Tier Data Dissemination, The Grid Based Energy Efficient Routing, Coordinate Magnetic Routing (b) Hexagonal Path Data Dissemination, (c) Hierarchical Cluster-Based Data Dissemination, Energy-Efficient Mobile Sink Routing Algorithm, Mobile Sink-Based Routing Protocol (d) Minimum-Energy Asynchronous Dissemination, (e) Quad-Tree Based Data Dissemination, (f) Line-Based Data Dissemination), (g) Railroad, (h) Ring Routing

10 NON-HIERARCHICAL TACTICS FOR DATA DISSEMINATION IN MOBILE SINK WSN

Flat data dissemination mechanisms propose homogeneous role assignment to all nodes. No virtual infrastructure is created and all nodes equally participate in relaying and query forwarding tasks. Sink mobility necessitates periodic location updates to reconfigure source to sink routes. In order to minimize control overhead, some data dissemination strategies also propose dynamic repair of nearby paths for mobile sinks. Mobile sink updates its location to a limited neighborhood. These techniques reduce location update overhead to a great deal.

ART Protocol Hwang et al. in [58] projected an adaptive reversal tree based algorithm. A tree focused near sink allocated passing root node is formed. This is accomplished through original flooding. Source nodes use this tree to direct data intelligences near root node which then transports data to the sink. When sink moves out of range of this temporary root node, it assigns a new neighborhood node as new root. New root node then performs local repair to reconfigure only the affected paths to direct the reversal tree at itself. This reversal tree dynamically changes with change in sink position through the assignment of new temporary root node and updating the reversal tree links. ART efficient path restoration machine decreases sink's communication overhead but may outcome in suboptimal source to sink tracks

ALURP and LURP G. Wang et. al. in [59] propose a geographic data dissemination approach called LURP. In LURP, sink primarily floods its position information plus a virtual circular area (VC) positioned around its existing location. Then, as long as sink mobility is limited in VC local transmission is achieved. Departure from VC needs global flooding. Nodes external VC use geographic routing to route data near sink. Once packet reaches inside VC, straight path routing is used on sink efficient footpaths. G. Wang in ALURP [60] propose an amelioration over LURP. In ALURP, radius of VC is modified conferring to the flexibility of the sink. This decreases native broadcast cost. Additionally, amount of universal flooding necessities are also condensed as VC size can be vigorously altered.

Dynamic Shared Tree (DST) [61] proposes a multiple sink, sink-oriented tree based technique that utilizes local update technique to repair the broken links. Only one sink called Master sink registers itself to a temporary root node which then creates tree rooted at itself. Other sinks known as slave sinks utilize the tree created by master sink. The data transfer to the slave sinks is via the path *source* to *master* and *sink* to *slave sink*. DST can be applicable for firefighter application where all firefighters may need information. Only one firefighter maintains routing structure. Other firefighters (sinks) utilize master sink for data collection.

In Sink Mobility Support (SMS), sink repairs changing paths by acquiring neighbor tables of neighbor nodes. This enables sink to repair changing paths due to mobility. Unlike LURP [59], ALURP [60] and DST [61] SMS does not require position aware nodes. All of these techniques reduce the flooding costs. Flat data dissemination mechanisms have limited scalability. They may not be an ideal choice for large MSWSN applications.

11 CONCLUSIONS & DISCUSSIONS

Wireless Sensor Network technology suggestions an important possibility in frequent application domains. Given the various nature of these domains, it is important that WSNs achieve in a reliable & robust fashion. I consider, wireless sensor network has proved its practice in the future dispersed calculating environment. However, there are significant amount of technical experiments & design matters those wishes to be addressed. One of the major challenges is the designing of efficient network management architecture to continuously support WSNs for providing amenities for

numerous sensor applications.

This paper firstly proceeds to categorize Dissemination strategies in wireless sensor networks. This taxonomy includes flat, hierarchical, QoS, and location-based and numerous other. A state of the art review of mobile sink based WSN data dissemination mechanisms has been presented. These strategies have been classified according to mobility models, data collection architectures, route initiating entities and sink cardinality. The effect of these strategies on network lifetime and application requirements has been discussed. Pros and Cons of these classified approaches have been highlighted.

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